CONSTRUCTIVE DESIGN FOR RESERVOIR AND POOL CLEANING DEVICE

Field of the invention

The present utility model refers to devices used in pool cleaning systems, specially adapted to remove sediments and debris accumulated at the bottom of reservoirs and pools.

Background of the state of the art

Maintaining the proper conditions to use of pools comprises a group of processes that intend to (1) keep the water's chemical characteristics within predefined parameters; (2) avoid proliferation of microorganisms and algae; (3) guarantee the water's transparency by removing suspended matter and (4) maintain the bottom free of sediments and debris deposited there by decantation.

Traditionally, to remove decanted material hand bottom vacuum cleaners are used. However, this process must be carried out frequently and requires specialized labour, increasing the costs of operating pools. The advantages resulting from automating this process have led to the conception of alternative methods, based on the introduction of turbulence at the bottom, in order to suspend the decanted material that is sucked by one or more bottom drains and held by the filter. The above mentioned turbulence is provided by jets of water adjacent to the pool's bottom, which have cleaning head built into the floor, equipped by a retractile piston that rises above the latter due to the water pressure supplied by a pump. The piston has, at the upper part, a nozzle or hole as an exit for the water under pressure, producing the jet adjacent to the reservoir's bottom. The jet's range is considerable, since the Coanda effect makes it remain "stuck" to the bottom's surface;

Patent US 5,251,343 describes a bottom's cleaning head equipped with a mobile piston, into which the water enters in a

vertical ascendant direction, ejected by horizontal exit in the radial direction provided at the upper portion of said piston. The water pressure against its lower surface provides the rising of the latter above the pool's floor, its return is provided by a spring. This system requires means to allow the change of the jet's direction, in order to sweep the 360° of the bottom's area that surrounds the head. In the object of US 5,251,343 such means comprise a pair of opposite guide pins, moving jointly with the piston, on two cylindrical opposite trapezoidal groove courses. At each jet production cycle, the piston rises and retracts, which makes the pins advance to the next groove, resulting in a turn whose angle depends on the characteristics of the above mentioned grooves. This turn allows the jet's angular movement, resulting in the sweeping of the entire area surrounding the head.

Although theoretically apparent to be adequate, the system described has some practical inconveniences, due to the complexity of the mechanism used to obtain the above mentioned angular movement, which results in a high production cost. Additionally, the guide pins, necessarily thin because of the nature of the system, have their useful life limited due to wear by friction.

Document US 4,212,088 describes a system in which the piston has, at its lower portion, a set of wings positioned as a "turbine", which provides the rotational momentum to turn the piston at the beginning of the upward movement. Complementing the effect of said turbine, the horizontal portion of the jet's exit duct is eccentrically positioned, in order to generate a reaction tangential force that tends to turn the piston. The angle of that turn is random; depending on the pressure variations of the water supply, flow irregularities, temperature, etc. successively activating and interrupting the water supply to the head produces a sequence of random rotational

movements of the piston and of the respective jet, which finishes covering the entire surrounding bottom's area.

Despite having a simpler structure, the device described in document US 4,212,088 also has production problems, mainly regarding the manufacture of said turbine. Another inconvenience, clearly seen cross section view of Fig. 2, is the format of channel 66-68 that gives way to the water and, due to its curved design, requires special production techniques.

Yet another disadvantage of that system is the fact of having to gradually open the valve that feeds the head, as a fast opening would make the piston move nearly instantaneously to the upper position, in which the turning of the piston is locked. In order to obtain this gradual opening, the referred invention uses a complex device, subject to wear and is costly.

Objectives of the utility model

In view of the above, a first objective is to provide a bottom's cleaning system, comprising one or more devices that produce jets of water adjacent to the bottom with sufficient intensity to move the debris decanted there, placing them in suspension in a liquid means and allowing their removal by suction through the drain at the bottom.

Another objective is to provide devices in which he direction of the water jet by modified by random phases in order to cover the entire surrounding area.

Another objective is to structurally provide simple devices simples that do not require sophisticated techniques and costly.

Brief description of the utility model

The objectives above are attained by providing a piston that moves between to end positions, a lower resting one and an upper operating one, said movement is caused by the water pressure and

the return to the resting position is provided by the piston's force-weight, the turning movement is only caused by the reaction of a water jet eccentrically directed in relation to said piston's axel.

According to another characteristic of the utility model, the water inlet and outlet channels are rectilinear.

According to yet another characteristic of the utility model, the piston's turning occurs during the phase in which the piston is travelling between said end positions.

According to another characteristic, the interruption of the water supply to each head occurs gradually to avoid the ram stroke.

According to yet another additional characteristic, the piston's random turning occurs during the downward movement when returning to the resting position.

Description of the drawings

The details, advantages and characteristics of the utility model proposed will be better understood through the description of a preferred embodiment and the drawings that refer to it, in which:

Figures 1 and 2 show a known device, object of US 4,212,088.

Fig. 3 shows, by means of a cross cut view, the utility model proposed, in its preferred embodiment format.

Fig. 4 details two aspects of the piston's body.

Fig. 5 shows, by means of a cross cut view, the operation of the utility model.

Detailed description of the utility model

Referring now to Fig. 3, the utility model proposed comprises a body made up by a PVC "T" coupling 11, which side part 12 connects to the piping 13 that links up to the system (not shown), which supplies water under pressure. The "T" upper edge fits into a first flange 14 that bears against the metal, vinyl or fibreglass reservoir's or pool's bottom outside face 15 (lower). On the opposite side of said

flange and bearing against the bottom's upper face 16, is a second flange 17, which overlaps third flange 18; the set being attached by stainless steel screws (not clearly shown in the figure).

As the figure shows, piston 21 has a substantially cylindrical shape with discoidal broadenings 22, 23 at both ends. In the resting position, show in Fig. 5-a, said upper broadening 22 leans on a ring collar of the third flange 18, keeping the piston's top 25 aligned with the surface. Parallel to the vertical axel 26 of said piston there is an inlet water channel 27 that goes from the piston's base up to the proximity of the upper discoidal broadening, without perforating it. This channel connects to the jet forming horizontal duct 29, which goes in a direction that does not coincide with the piston's axel, according to Fig. 4-b.

Still according to Fig. 3, a rod 31, preferably of stainless steel, is screwed into a hole that coincides with the piston's axle, extending up to the lower area of the "T", where it slides through the central hole if a guide-disk 32. This assembly allows the piston's perfect alignment at all its positions, making it possible to vertically slide with no leaps. The sealing against leaks at the lower mouth of the said "T" is provided by means of a plug 33 attached with adhesive.

According to Fig. 5-a, when the water is applied under pressure 41, adduced by the inlet piping 13, a force 42 is generated, from bottom to top, which is applied on the piston's lower face 21, starting its upward movement from its initial resting position.

Fig. 5-b shows the piston in the operational position, i.e., at the end of its upward vertical course. In this situation, the lower discoidal broadening edge 23 bears against the ring collar's lower face 24. Force 42, resulting from the push of the water under pressure, maintains the piston firmly positioned, inhibiting its rotation, thus stabilizing the direction in which the jet 43 goes, which allows it to reach the

foreseen distance from the cleaning head.

In Fig. 5-c the supply of water under pressure is being interrupted, which is carried out gradually in order to avoid the ram stroke. Thus, said gradual interruption is provided by the opening of the next valve before closing the present one, therefore, resulting in a time interval in which the water flow 41' that feeds the head is reduced little by little. As a consequence of the fall of pressure that kept the piston at its upper operational position, the latter will move downwards under the influence of its own weight 44. During this movement, the water's residual pressure produces a residual jet 43'. The reaction force tangential component of this jet 43' produces a rotational momentum that results in the piton turning some degrees around its axle, so, when said head is activated again, the jet will have a new direction. The successive turning angles resulting from the above mentioned effect are random, but after a plurality of operation cycles, around 20 cycles, all the 360° surrounding the device will have been swept.

In the practical applications, a plurality of heads of the type described will be used, distributed in a manner that their jets clean the bottom's total area. In such an arrangement, said devices are activated one at a time by means of an assembly of solenoid valves, which operation is controlled by a set of cams assembled on a rotating axle, according to known control processes.